2004

Distinct Group Differences and Discriminant Validity of the Adjustment Scales for Children and Adolescents: Attention Deficit Hyperactive Disorder versus Conduct Disorder

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Distinct Group Differences and Discriminant Validity of the Adjustment Scales for

Children and Adolescents: Attention Deficit Hyperactive Disorder versus Conduct Disorder

(TITLE)

BY

James Richard White

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

School Psychology

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

2004
YEAR

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Running head: VALIDITY OF THE ASCA

Distinct Group Differences and Discriminant Validity of the Adjustment Scales for Children and Adolescents: Attention Deficit Hyperactivity Disorder versus Conduct Disorder

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Acknowledgments

I would like to thank my thesis chairperson, Gary L. Canivez and thesis committee members, Assege HaileMariam and Mike Havey for their supervision and suggestions throughout the course of the program. I would also like to thank the dedicated school personnel who assisted in referring participants for my study. Additionally, I would like to thank my entire family for their continued support. Without their help and encouragement my accomplishments would not have been possible.

Abstract

The present study examined the distinct group differences and discriminant validity of the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Marston, & Stott, 1993). Participants included 37 children in kindergarten through twelfth grade. Thirty children met DISC-IV/DSM-IV criteria for Attention Deficit Hyperactivity Disorder and 7 met DISC-IV/DSM-IV criteria for Conduct Disorder. Participants were classified based on the results of the DISC-IV parent interview administered by school psychology interns. The teacher completed the ASCA when the student was initially referred. Results of the present study provided further support for the discriminant validity of the ASCA. The results of the MANOVA and ANOVA demonstrated distinct group differences between the ADHD and CD groups. Students in the CD group had statistically significant higher scores on the SAP, SAI, OPD, and DEL syndromes as predicted. Diagnostic accuracy was further evidenced through high rates of sensitivity (true positive rate), specificity (true negative rate), positive predictive power and negative predictive power. Overall correct classification (hit) rate of 92% was achieved when differentiating ADHD from CD students.

Distinct Group Differences and Discriminant Validity of the Adjustment Scales for Children and Adolescents: Attention Deficit Hyperactivity Disorder versus Conduct Disorder

Behavior rating scales have gained universal acceptance among child specialists in assessing child behavioral and emotional problems (McDermott et al., 1995). Research suggests this may likely be due to a preference among such specialists for objective, rather than inferential, assessment methods that provide links between assessment and possible treatment plans (Reschly & Ysseldyke, 1995). According to Stinnett, Havey, and Oehler-Stinnett (1994), rating scales are the most common instruments used in the assessment and diagnosis of children with behavioral problems.

Rating scales are considered a vital component in the evaluation process of children with behavioral concerns. These tools provide measurable data on infrequent behaviors that may not be observed during a direct observation of behavior. In addition, they provide a method of collapsing broad information about a child across a variety of situations into valuable samples of behavior. Furthermore, rating scales provide quantitative data concerning a child's statistical deviance from a normative group that

can facilitate a possible diagnosis (Danforth & DuPaul, 1996).

Natural observers such as teachers can provide unobtrusive observations of students' behavior in the school setting. Teachers are considered natural observers because of their past experiences and ability to compare a particular student to the normative behaviors of students they have observed over time (McDermott, 1993; Watkins & Canivez, 1997). Additionally, "teachers have been considered to be among the most accurate and objective adult raters of child behavior" (Canivez & Rains, 2002, p. 621; Kamphaus & Frick, 1996; Martin, Hooper, & Snow, 1986).

For rating scales to be considered useful in the assessment of childhood psychopathology, they must demonstrate adequate psychometric properties. Rating scales that have been standardized based upon a large normative sample across a wide age range show advantages over scales that have not (Thomas & Grimes, 2003). Information gathered from rating scales are quantifiable and amenable to tests of reliability and validity, which determine the inferential strength of the particular instrument. Other advantages of psychometrically sound rating scales include: (1) the use of multiple items which provide data on a broad range of problems rather than

focusing only on the referral concern; (2) information is organized into groupings of different syndromes and broad scales; (3) they provide a standard for determining the severity of the problem; (4) they are considered to be economical and cost efficient; and (5) they can be used to compare data from multiple informants such as caregivers, teachers, and other observers (Thomas & Grimes, 2003).

Though teachers have been considered the most accurate raters of child behavior (Kamphaus & Frick, 1996; Martin, et al. 1986), they are still subject to rater bias, such as halo effect, leniency error, central tendency error and rater agreement (Canivez, Perry, & Weller, 2001). Martin, Hooper, and Snow (1986) suggested that the subjectivity of raters is the primary source of error in rating scale data. These issues are understood and recognized by school professionals and are usually considered during the assessment process. However, in order to be considered relevant, rater agreement must be tested with observers in the same environment.

In addition to acknowledging these possible problems with rating scales, child specialists pay particular attention to relevant psychometric concerns when making inferences from rating scales. In order for a rating scale to be meaningful and useful, as well as reflect an accurate

depiction of youth psychopathology, it must be normed on a large and representative national sample (McDermott, 1994). One such rating scale gaining empirical support for it's sound structure is the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Marston, & Stott, 1993).

The ASCA is an objective teacher report behavior-rating instrument used to assess psychopathology among youths. It is a nationally normed rating scale designed for use with children ages five through 17. The ASCA was standardized on a nationwide sample of 1,400 (700 male, 700 female) noninstitutionalized children in grades kindergarten through 12. The sample was constructed according to the 1988-1990 U.S. Census and stratified random sampling was used to fit the sample to census proportions in age, grade level, gender, race/ethnicity, parent's education level, family structure, national region, community size, and associated handicapping conditions (McDermott, 1993; 1994).

The ASCA offers both a male and female version of the rating form with the only difference being the gender references. The teacher must be given the correct version of the ASCA form even though the items content of the two versions are identical. This facilitates a more student specific measurement, which helps the teacher focus

directly on the target child. It is crucial that the teacher be familiar with the typical, day-to-day behavior of the particular student being evaluated. The teacher is required to have observed the student a minimum of 40 school days.

The ASCA contains 156 total items, 97 of which are scored for dimensions of psychopathology that focus on deviant behavioral responses to common situations involved within a classroom and other school environments. It defines behavior pathology through rater observations of similar problem behavior(s) in different situations (McDermott, 1993). The teacher must choose from observable symptomatic or normal behavioral descriptions relative to 29 specific social, play or learning situations (McDermott, 1993; 1994). McDermott (1994) presented a situation in which a student is corrected by his/her teacher. The ASCA rating form provides the following behavior descriptions: "Improves for the moment, but does not last long," "Accepts correction without fuss," "Takes correction badly" (Sulky muttering, expression, etc.), and "Answers back aggressively" (threats, disturbance), (McDermott et al., 1993; McDermott, 1994, p. 4).

Most other behavior rating scales attempt to identify behavior problems by recording the teacher's estimate of

frequency and/or intensity of symptoms and do not assess behaviors across multiple contexts or environments. The symptomatic descriptions recorded throughout the ASCA form allow the specialist to determine if problem behaviors are isolated to a particular context, or present among multiple situations. The severity of the pathology can be determined from its pervasiveness across different circumstances (McDermott et al., 1995).

The ASCA contains six core syndromes, two supplementary syndromes, and two overall adjustment scales (Overactivity and Underactivity). The six core syndromes, which have been found to be reliable across gender, age, and race/ethnicity (McDermott, 1993; 1994) include Attention Deficit/Hyperactive (ADH), Solitary Aggressive-Provocative (SAP), Solitary Aggressive-Impulsive (SAI), Oppositional-Defiant (OPD), Diffident (DIF), and Avoidant (AVO). The six core syndromes were found to produce a two-factor solution (McDermott, 1994; Canivez, 2004). Canivez (2004) replicated the core syndrome factor structure of the ASCA and concluded that the rating scale indeed measured two independent dimensions of psychopathology, Overactivity and Underactivity (Canivez, 2004). The Overactivity adjustment scale is comprised of the ADH, SAP, SAI, and OPD syndromes. The DIF and AVO syndromes are combined to form

the Underactivity adjustment scale. These dimensions are similar to conduct problems/externalizing and withdrawal/internalizing dimensions commonly found in other child psychopathology assessment tools (Achenbach, 1991; Merrell, 1994; Quay, 1983; Reynolds & Kamphaus, 1992).

The two supplementary syndromes include Delinquency (DEL) and Lethargic-Hypoactive (LEH). Though the supplementary syndromes are not applicable across the entire youth population; they are reliable and valid for specific subgroups. The Delinquency syndrome is reliable and valid for all youths except for females under the age of 12. The Lethargic-Hypoactive syndrome is appropriate for both males and females who are below the age of 12. Each of the syndromes and adjustment scales are reported as normalized *T* scores ($M = 50$, $SD = 10$)(McDermott, 1994).

McDermott (1994) recommended three approaches for the interpretation of the ASCA. The commonly utilized cut-score interpretation method designates three score ranges for identifying "Adjusted" (*T* score < 60), "At-Risk" (*T* score between 60 and 66), and "Maladjusted" (*T* score > 66, behavior more severe than 95% of youth) behavior. The cut-score method provides information for possible classification or diagnosis of a specific pathology.

The syndromic profile interpretation method compares the child's *T* scores for the six core syndromes to 22 different profile types identified in the standardization sample. This method provides distinct classifications for variations of adjusted or "normal" youth functioning by computing a generalized distance score. The child is assigned to the profile type that is most similar to their personal characteristics, which will produce the smallest generalized distance score. The ASCA syndromic profiles have been found to be significantly reliable across raters and time (Canivez, Perry & Weller, 2001; Canivez & Watkins, 2002; Canivez, 2001).

The discriminant classification method of interpreting the ASCA involves a discriminant calculation, which categorizes the child within a socially/emotionally "normal" functioning population, or that of a population which resembles socially/emotionally "disturbed" characteristics. Schowengerdt (2001) argued against the "best fit" profile method of interpretation due to the difficulty of matching the obtained scores to a particular profile; additionally, the discriminant classification method should be used with caution because of its dependence on multiple mathematical calculations for accurate classification (Schowengerdt, 2001). However,

development of a computerized analysis template eliminates mathematical errors (Canivez, 1996) and the discriminant classifications method of interpretation has been found to be reliable across raters and time (Canivez, Perry & Weller, 2001; Canivez & Watkins, 2002; Canivez, 2001).

ASCA Reliability Studies

Internal Consistency. Numerous studies regarding reliability and validity of ASCA scores suggest that the ASCA is a psychometrically sound behavior rating scale (McDermott, 1994). Internal consistency estimates for the six core syndromes and two supplementary syndromes ranged between .68 (DEL) and .86 (ADH) for the standardization sample (McDermott, 1994). McDermott (1994) also presented evidence of internal consistency for the Overactivity and Underactivity adjustment scales equaling .92 and .82, respectively.

Stability. McDermott (1994) reported a test-retest stability study of 40 female students observed by five volunteer teachers. The ASCA rating scale was collected after the initial observations and distributed again after a 30-school day interval. No significant differences were found between test and retest means and statistically significant stability coefficients ranged from .66 to .91 for the six core syndromes and two supplemental syndromes.

Noteworthy was the .91 retest stability of the Delinquent syndrome. The Overactivity and Underactivity scales yielded stability coefficients of .75 and .79, respectively.

Canivez, Perry, and Weller (2001) conducted a 90-day stability study of the ASCA with a sample of 124 (67 male, 57 female) students ranging from five to 19 years of age. Canivez et al. (2001) also found statistically significant test-retest stability of ASCA scores with coefficients that ranged from .48 (AVO) to .68 (SAI) for the six core syndromes, two supplementary syndromes and two global adjustment scales. Canivez et al. went on to report that although statistically significant stability coefficients were obtained in the study, they were lower than those found for other teacher report behavior-rating scales. This distinction may be attributed to the difference in how the individual items are scored. The dichotomous nature of the ASCA items differs from most other rating scales such as the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983, Achenbach, 1991) and Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992), which utilize a Likert scale system that introduces greater variability at the individual item level as well as in the total scores.

Syndromic profile classifications and discriminant classifications, two additional methods of interpreting the ASCA, have also been found to be stable over time (Canivez et al., 2001). Stability of these two methods of interpretation were examined through the use of kappa coefficients and *z* tests due to the nominal scale of classifications that result. Kappa (κ) is a nominal scale statistic (similar to correlation coefficients in that it ranges from -1 to +1) that provides an index of agreement beyond chance.

Results of the previous study indicated that syndromic profile and discriminant classifications showed statistically significant agreement from Time 1 to Time 2 (Canivez et al., 2001). However, though kappa coefficients were found to be statistically significant, indicating generally stable classifications between test and retest, clinical significance for the stability of the 22 Syndromic Profiles and Discriminant classifications was considered poor to fair. This may have been due to a small sample size resulting in many of the 22 syndrome profiles not being represented. A larger sample size would be needed in order to produce more or all of the 22 syndrome profiles necessary for a sufficient investigation of the stability

of the syndromic profile classification method (Canivez et al., 2001).

Interrater/Interobserver Agreement. Research focused on interrater agreement has also been investigated with the ASCA. This is an important issue to address because it measures the extent to which the inferences made from the ratings fluctuate as a function of the rater, rather than the student being rated. McDermott (1994) reported no significant mean differences between observer's ratings of the students. Interrater agreement correlations were statistically significant and ranged from .65 (AVO) to .85 (SAP) for the six core, and two supplementary syndromes. The Overactivity and Underactivity scales yielded interrater agreement correlations of .81 and .84, respectively (McDermott, 1994).

Watkins and Canivez (1997) examined the interrater agreement of the ASCA with a larger, more diverse sample of students than was used by McDermott (1994). Participants in this study included 71 students who were rated by 29 observers in 24 different classrooms. Results were similar to those of McDermott (1994) in that interrater reliability coefficients of syndrome *T* scores were considerable with only two scales differing at a statistically significant level (Watkins & Canivez, 1997). Even so, because of the

minimal mean differences in raw score points representing small effect sizes, these differences were not considered clinically meaningful.

The Syndromic Profile Classification and Discriminant Classification methods of interpretation have also been found to be significantly reliable across raters (Canivez, Watkins & Schaefer, 2002; Canivez & Watkins, 2002). Canivez & Watkins (2002) conducted a study of interrater agreement of ASCA syndromic profiles. Interrater agreement for the 22 syndromic profile classifications yielded a kappa coefficient of .39. Furthermore, the five, three and two broad category classifications generated adequate kappa coefficients of .53, .60, and .68, respectively.

Canivez et al. (2002) reported statistically significant interrater agreement for the Discriminant Classification interpretation method ($\kappa = .51$, $p < .00001$) at a substantial level. Results indicated that of the 119 students used in the study, 77% were classified in the same category by both raters. Only nine (8%) of the students were classified as "normal" by rater 1 but "Socially/ Emotionally Disturbed" by rater 2. This level of agreement for the Discriminant Classification method of interpretation was higher than the 90-day test-retest

stability study of the ASCA obtained by Canivez et al. (2001) that yielded a kappa coefficient of .35.

ASCA Validity Studies

Convergent/Divergent Validity. Evidence of convergent and divergent construct validity of the ASCA has been examined through a number of comparison studies. McDermott (1994) analyzed the convergent validity of the ASCA and the Revised Conners Teacher Rating Scale (CTRS; Trites, Blouin, & Laprade, 1982). This study consisted of a sample size of 274 youths ranging from kindergarten through 12th grade (*M* age = 12.5, *SD* = 2.9) representing ten different special education categories. Administration of the ASCA and CTRS was counterbalanced with the second rating scale being completed 16 days after the first. Teachers voluntarily completed the rating scales after having the opportunity to observe the student(s) for at least two months. Results produced convergent validity coefficients ranging from .65 to .91 when comparing similar dimensions of the two rating scales (McDermott, 1993; 1994). The four overactive core syndromes of the ASCA were highly correlated with the Conduct Problem and Hyperactivity factors of the CTRS. In support of the instruments' divergent validity, this analysis yielded exceptionally low correlations between the

Overactivity and Underactivity core syndromes of the ASCA (McDermott, 1993; 1994).

A second investigation involved the comparison of ASCA teacher ratings with parent ratings from the Child Behavior Checklist (CBCL; Achenback & Edelbrock, 1983) for a sample of 48 preadolescents ranging in age from 7.3 - 11.9 (McDermott, 1993, 1994). Evidence of convergent validity was provided with statistically significant moderate correlations (.42 to .75) between the ASCA Overactivity syndromes and Aggressive, Hyperactive, and Delinquent factors of the CBLC. Correlations between Underactivity core syndromes and overall adjustment scale of the ASCA and Internalizing factors of the CBCL were also found to be statistically significant (McDermott, 1993, 1994).

Support of convergent and divergent validity was also reported when comparing the ASCA with the Preschool and Kindergarten Behavior Scales (PKBS; Merrell, 1993)(Canivez & Rains, 2002; Canivez & Bordenkircher, 2002). Canivez and Bordenkircher (2002) used a random sample of 154 five-and-six year-old children rated by 16 teachers. Results produced evidence of convergent validity for the Overactivity syndromes of the ASCA and the Externalizing Problems dimensions of the PKBS; simultaneously

demonstrating divergent evidence of the ASCA Underactivity syndromes and the Externalizing Problems of the PKBS.

Canivez and Rains (2002) conducted a similar study as Canivez and Bordenkircher (2002) with a randomly selected sample of 90 kindergarten, and 29 first grade students. Again, results provided strong evidence of convergent validity between the ASCA Global Overactivity scale and the Externalizing Problem scale of the PKBS (r = .84). Support of divergent validity was provided with a correlation coefficient of -.06 between PKBS Externalizing Problems and the ASCA Underactivity Global scale (Canivez & Rains, 2002).

Similar results were also found between comparisons of PKBS subscales and core syndromes of the ASCA (Canivez & Rains, 2002). The PKBS Self-Centered/Explosive (SC/E), Attention Problems/Overactive (AP/O), and Antisocial/Aggressive (A/A) subscales correlated significantly and at moderate to high levels (ranging from .48 to .84) with the ASCA Attention Deficit-Hyperactive (ADH), Solitary Aggressive-Proactive (SAP), Solitary Aggressive-Impulsive (SAI), and Oppositional Defiant (OPD) syndromes. PKBS SC/E, AP/O, and A/A subscales and the ASCA Diffident (DIF) and Avoidant (AVO) syndromes yielded low to

near-zero correlations ranging from -.19 to .09 (Canivez & Rains, 2002).

Sprouls (2002) investigated the convergent validity of the ASCA by comparing it with the ADD-H Comprehensive Teacher's Rating Scale (ACTeRS; Ullmann, Sleator, & Sprague, 1991) with a sample of 106 students ranging from grade 1 through 6. Pearson product-moment correlations between the ASCA and ACTeRS provided significant support for the two similar rating scales. The ADH syndrome of the ASCA correlated significantly with the Attention scale (r = -.63) and the Hyperactivity scale (r = -.66) of the ACTeRS. Additionally, the OPD syndrome of the ASCA was significantly and moderately correlated (r = .55) with the Oppositional Behavior scale of the ACTeRS (Sprouls, 2002).

Additional evidence of divergent validity has been reported in the ASCA manual. McDermott (1993; 1994) found low correlations between the ASCA and the Differential Abilities Scale (DAS; Elliott, 1990). The cross-standardized sample of 1,200 youths was made up of the overlapping portions of the national standardization samples of the ASCA and DAS. Correlations were produced between the DAS indices of intellectual ability and academic achievement along with dimensions of the ASCA. Correlations between the ASCA and DAS were low, ranging

from -.24 to .10, with the minimal significance primarily relying on the large sample size. These results indicated that the psychological adjustment measured by the ASCA accounted for no more than 6% of the variability in ability and achievement as measured by the DAS (McDermott, 1994). These results were replicated by Canivez, Neitzel, and Martin (in press) in comparing the ASCA to the K-BIT and WISC-III.

Discriminant Validity. The ASCA's discriminant validity was examined with 150, 5 through 17 year olds diagnosed as emotionally disturbed matched with a sample of 150 non-handicapped youths on variables of age, grade level, gender, and ethnicity (McDermott, 1993, 1994; McDermott et al., 1995). The discriminant function analysis using covariance matrices produced a significant effect for group separation on the basis of the core syndromes. The classification analysis yielded an accuracy rate of 80.7% for differentiating the two groups (McDermott, 1993, 1994; McDermott et al., 1995). Diagnostic accuracy was further demonstrated by McDermott (1993; 1994) through successfully distinguishing the 150 emotionally disturbed youth from learning disabled, speech impaired and gifted youth. Discriminant analysis produced significant specificity and overall accuracy ratings of

approximately 80% for differentiating the groups. This evidence consistently supported the ASCA's ability to successfully classify social and emotional disturbances among youths.

Canivez and Sprouls (in press) demonstrated discriminant evidence of construct validity by assessing the diagnostic accuracy of the ASCA in differentiating students meeting National Institute of Mental Health (NIMH) Diagnostic Interview Schedule for Children (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000)/DSM-IV criteria for ADHD from a randomly selected and matched control group. The one-way multivariate analysis of variance produced statistically significant results for differences between the ADHD group and the control group with the six core syndromes of the ASCA rating scale (Canivez & Sprouls, in press). Fisher's linear discriminant function coefficients from the discriminant function analysis of the ASCA were also reported statistically significant (Canivez & Sprouls, in press). The overall accuracy of correct classification (hit rate) was reported at 96%, demonstrating near perfect agreement between ASCA results and DISC-IV classifications. The ASCA ADH core syndrome provided the greatest differentiation between the groups (Canivez & Sprouls, in press).

Groups of individuals that differ on a particular construct should differ on a test that claims to measure such constructs. Canivez and Sprouls (in press) illustrated strong evidence of distinct group differences and discriminant construct validity of the ASCA. The results showed the ASCA to be quite accurate in correctly differentiating individuals meeting DISC-IV/DSM-IV criteria for ADHD from those in the presumably normal control group. However, there has been no investigation of the ASCA's ability to differentiate between distinct behavioral disorders. Furthermore, there only appears to be two discriminant validity studies of the ASCA overall. In order to determine the ASCA's utility for differential diagnostic purposes, further research exploring its discriminant validity and diagnostic efficiency (classification accuracy) is necessary.

Canivez and Sprouls (in press) suggested that future research should examine the ASCA's ability to differentiate not only ADHD from random and presumably normal students but differentiate ADHD from other externalizing problems such as oppositional-defiant and conduct disorders. This would involve a much more rigorous evaluation of the ASCA's ability to discriminate between diagnostic groups. If the ASCA were capable of differentiating between ADHD and other

externalizing disorders, such as conduct disorders, at levels similar to Canivez and Sprouls (in press) then utilizing the ASCA for actuarial classification would be strongly advocated. Consequently, more costly tools of psychological assessment that have not shown strong support of discriminant validity may no longer need to be used (Canivez & Sprouls, in press).

The present study attempted to further examine distinct group differences and discriminant evidence of construct validity of the ASCA by investigating the ASCA's ability to differentiate those meeting DISC-IV/DSM-IV criteria for ADHD from those meeting criteria of conduct disorder (CD).

Conduct Disorder (CD) is one of the most serious mental health problems affecting children and adolescents (Sholevar, 1995). Unfortunately, this disorder has proven highly resistant to psychosocial interventions, which most likely leads to an antisocial personality disorder, substance abuse, criminal behavior, and other serious social problems in adulthood (Kazdin, Rodger, & Colbus, 1987). The essential feature in CD according to DSM-IV-TR (2000) is a:

> repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated (DSM-IV-TR, 2000, p. 100-101).

These behaviors fall into four main groupings: 1) aggressive conduct that causes or threatens physical harm to other people or animals, 2) nonaggressive conduct that causes property loss or damage, 3) deceitfulness or theft and 4) serious violations of rules. In order to be diagnosed with CD, 3 out of the 15 DSM-IV-TR criteria that fall under these four groupings must be exhibited within the last 12 months, with at least one criterion present in the past 6 months. Two subtypes of CD are provided based on the age at onset of the disorder (Childhood-Onset Type and Adolescent-Onset Type)(DSM-IV-TR, 2000).

According to the DSM-IV-TR (2000) the essential feature of Attention-Deficit/Hyperactivity Disorder is a:

> persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development (DSM-IV-TR, 2000, p. 92-93).

Conduct Disorder's co-occurrence with ADHD and other psychiatric disorders is substantial, still, factor analyses provide supportive evidence which yield distinct, but correlated dimensions between areas of hyperactivity/attention deficits and conduct

problems/aggression (Quay, 1983; Ullmann, Sleator, & Sprague, 1984; Hinshaw, 1987).

Researchers have identified several important distinctions between CD and ADHD group of children (Hinshaw, 1987; Sholevar, 1995). Specifically, antisocial parents, family hostility, and low SES typically plague children diagnosed with CD but not ADHD. Children with ADHD tend to display more cognitive and achievement deficits then do children with CD (Hinshaw, 1987). Additionally, children with ADHD are more frequently off task in classroom and playroom situations, however are not at risk of for deviant behavior as adolescents; whereas CD children are more frequently on task in structured settings suggesting that they have greater control over their own behavior yet are still at greater risk of worse behavior outcomes as adolescents.

Many clinical studies suggest a considerable degree of comorbidity between CD and ADHD (Biederman, Newcorn & Sprich, 1991; Sholevar, 1995). In a follow-up study with 236 ADHD children, Barklay, Fischer, Edelbrock and Smallish (1990) found that almost 60% of the students diagnosed with ADHD had developed CD later in adolescence. Part of the problem in assessing ADHD and CD comorbidity stems from the high intercorrelations between hyperactivity and conduct

disorder characteristics (Sholevar, 1995). Additionally, the fact that the behaviors described as DSM criteria for CD are more typical of adolescents than of children younger than 12 years of age makes it difficult to identify individuals who truly have a co-occurrence of both an ADHD and CD diagnosis before adolescence.

The purpose of the present study was to investigate distinct group differences (ADHD vs. CD) and discriminant evidence of construct validity of the ASCA. Because of the ASCA scale independence between core and supplemental syndromes, more unique variance is measured and accounted for. Furthermore, the lower correlations reported between the ADH, SAP, SAI, OPD and DEL syndromes should allow the ASCA to successfully differentiate ADHD and aggression/conduct disorders (Canivez. 2004; Canivez & Bordenkircher, 2002; Canivez & Rains, 2002; McDermott, 1993; 1994). Other rating scales, such as the BASC, have shown higher correlations between hyperactivity and aggression scales, producing more overlap in the variance measured. It was hypothesized that those meeting DISC-IV/DSM-IV criteria for ADHD would score higher on the ADH syndrome of the ASCA, whereas those who met criteria for CD would score higher on the DEL, OPD, SAP and possibly the SAI syndromes.

A discriminant function analysis (Tabachnik & Fidell, 2001) was carried out to assess the ASCA's diagnostic accuracy or efficiency in differentiating children meeting DISC-IV/DSM-IV criteria for ADHD from those meeting CD criteria. Diagnostic efficiency statistics (Kessel & Zimmerman, 1993) including sensitivity, specificity, positive predictive power, negative predictive power, false positive rate, false negative rate and overall correct classification were systematically reported.

Method

Participants

Students ranging from 5 through 17 years of age were included in the present study (demographic information of the sample is presented in Table 1). Students were obtained from multiple Midwest suburban school districts that are within the North Suburban Special Education District (NSSED) and Special Education District of Lake County Cooperatives (SEDOL) jurisdiction, as well as from Rural Champaign County School District in central Illinios. Students referred for pre-referral intervention or triennial reevaluation that met the DISC-IV/DSM-IV criteria for ADHD and/or CD were included within this study.

Instruments

NIMH Diagnostic Interview Schedule for Children-Version IV. The NIMH Diagnostic Interview Schedule for Children Version IV (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) is a widely used structured interview which uses Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-IV-TR; APA, 2000) criteria to screen mental health disorders for children and adolescents. The DISC-IV consists of 36 mental health disorders in children and adolescents and has been researched with both clinical and general populations (Johnson, Barrett, Dadds, Fox, & Shortt, 1999; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Despite its greater length and complexity; the current standard NIMH DISC-IV compares favorably with earlier versions of the interview. In general, the DISC-IV showed moderate to good diagnostic reliability (kappa) for the parent interview (Shaffer, et al., 2000). No significant differences were found between test and retest categorical diagnoses with reliability coefficients (kappa) that ranged from .43 (CD) to .79 (ADHD).

Adjustment Scales for Children and Adolescents. The Adjustment Scales for Children and Adolescents (ASCA; McDermott, Stott, & Marston, 1993) is a standardized

behavior rating scale, which was normed on a representative national sample of 1,400 youths. It is intended for use with individuals between the ages of 5 and 17 (grades K-12). The ASCA contains 97 items scored for dimensions of psychopathology that focus on appropriate or deviant behavioral responses to common situations involved within a classroom. These 97 items are each assigned to one of six core syndromes: Attention Deficit/Hyperactive (ADH), Solitary Aggressive-Provocative (SAP), Solitary Aggressive-Impulsive (SAI), Oppositional-Defiant (OPD), Diffident (DIF), and Avoidant (AVO); or two supplementary syndromes: Delinquency (DEL) or Lethargic-Hypoactive (LEH). Four core syndromes (ADH, SAP, SAI, & OPD) are combined to form an Overactivity adjustment index (OVR); DIF and AVO syndromes are combined to form an Underactivity adjustment index. Each of the six core syndromes, two supplementary syndromes, and two overall adjustment scales are reported as normalized *T* scores (M = 50, SD = 10) and percentiles.

Procedure

Supervising school psychologists, as well as teachers employed within corresponding school districts, were informed of the present study. They were provided the opportunity to refer students who displayed behavior symptoms that resembled those of ADHD or CD children for a

pre-referral screening. Additionally, students referred for a triennial reevaluation, without the diagnosis of ADHD, in which an attention screening was to be conducted were also considered for possible participation in this study. Parents or primary caregivers of the students being referred were contacted to explain the assessment and intervention process. The student's primary caregivers were then interviewed using the DISC-IV parent interview, which was used as the independent criterion for group identification. The classroom teacher completed the ASCA rating scale immediately after referral, prior to the administration of the DISC-IV parent interview.

Data Analyses

Evidence of the ASCA's construct validity by means of distinct group differences was provided through one-way multivariate and univariate analyses of variance. The one-way MANOVA and subsequent one-way ANOVAs were conducted to assess differences between two groups (ADHD vs. CD) on the ASCA core syndromes and supplementary syndromes. Discriminant evidence of construct validity was also obtained. Diagnostic accuracy of the ASCA was investigated through a direct discriminant function analysis (Tabachnik & Fidell, 2001) with succeeding diagnostic efficiency statistics (Kessel & Zimmerman, 1993) calculated and

displayed within a Microsoft® Excel™ spreadsheet template (Canivez, 1994; Canivez & Watkins, 1996). Diagnostic efficiency statistics including sensitivity, specificity, positive predictive power, negative predictive power, false positive rate, false negative rate and overall correct classification were reported.

Results

Distinct Group Differences

The one-way multivariate analysis of variance for differences between the ADHD group and the CD group with the ASCA's six core syndromes and the supplementary Delinquency syndrome serving as dependent variables was statistically significant, Wilks $\Lambda = .53$, $F = 3.72$, $p < .005$, with an effect size of .47 and Power equal to .94. Subsequent one-way univariate analyses of variances were conducted to establish the degree to which the ADHD group and the CD group differed on the separate core and supplementary syndromes. Results of the ANOVAs revealed statistically significant group differences were present for the ASCA Solitary Aggressive-Provocative syndrome, $F(2,29) = 8.32$, $p < .01$; Solitary Aggressive-Impulsive, $F(2,29) = 9.66$, $p < .00$; Oppositional-Defiant $F(2,29) = 6.81$, $p < .01$; and Delinquency syndromes $F(2,29) = 9.71$, $p < .004$. Effect sizes for these syndromes, presented in

Table 3, were considered large (1.10 to 1.64) (Cohen, 1992; Glass & Hopkins, 1996).

Discriminant Validity

The direct discriminant function analysis was statistically significant; Wilks $\Lambda = .53$, $\chi^2_{(7)} = 20.20$, $p < .01$. Fisher's linear discriminant function coefficients from direct discriminant function analysis are presented in Table 4. The diagnostic efficiency statistics for the ASCA core syndromes are presented in Figure 1. The overall correct classification (hit) rate was .92, and the kappa coefficient indicated statistically significant agreement beyond chance ($K = .75$, $Z = 4.57$, $p < .0001$). Diagnostic accuracy was further evidenced through high rates of sensitivity (true positive rate) and specificity (true negative rate), .97 and .75, respectively. The positive predictive power (.93) and the negative predictive power (.86) rates were also found to be high. The false positive rate (.25) for the ASCA was low and identified a small number of ADHD students initially identified as having CD. Similarly, the false negative rate was low (.03) and revealed a very small number of CD students as ADHD.

Discussion

The purpose of this study was to examine the distinct group differences and discriminant evidence of construct

validity of the Adjustment Scales for Children and Adolescents (ASCA). This was conducted through investigation of the group differences in ASCA Core and Supplemental syndromes and ASCA's ability to differentiate those meeting DISC-IV/DSM-IV criteria for ADHD from those meeting criteria of conduct disorder (CD). Ascertaining discriminant validity and diagnostic efficiency are essential in the validation of any psychological measurement assessing ADHD, CD, or other psychopathologies. Significant differences with the approach in which instruments assess distinct pathologies can lead to differences in diagnosis and treatment. This study provided additional support for the validity of the ASCA rating scale.

Results of the present study first assessed the validity of the ASCA through distinct group differences. The mean differences and effect sizes (Table 3) revealed that the scores on the ASCA were significantly higher within the CD group than was obtained within the ADHD group on the four predicted syndromes (SAI, SAP, OPD & DEL). Thus, as hypothesized, the appropriate scales on the ASCA indicated that the groups differed significantly. The largest effect size was observed within the Delinquency syndrome, which is considered the scale most likely to

reflect CD problems. Due to the inclusion of the Delinquency syndrome when conducting the one-way multivariate analysis of variance, the sample size was reduced for the reason that females under the age of 12 are not included. The groups did not significantly differ on the Attention-Deficit Hyperactivity, Diffident, or Avoidant syndromes.

Discriminant validity was assessed to determine the accuracy of the ASCA when differentiating between groups. As expected, differences observed in the present study were not as large as found by Canivez & Sprouls (in press) in examining differences between students with ADHD and a matched control group. However, results were comparable to those observed by Ullman (1984) in examining differences between students with learning disabilities and students with ADHD using the ACTeRS. Still, in order to claim adequate conditions for use of a diagnostic test, one must demonstrate more than just differences between groups. Diagnostic utility of a test requires investigation of indexes such as overall classification, sensitivity, specificity, positive predictive power, negative predictive power, false positive rate, and false negative rate (Kessell & Zimmerman, 1993; Milich, Widiger, & Landau, 1987). Milich et al. (1987) suggested that predictive

power methods may be more helpful indexes in making a diagnosis than sensitivity and specificity.

McDermott et al. (1995) assessed group differences and the discriminant validity of the ASCA by differentiating a sample of seriously emotionally disturbed children from a random, presumably normal group. Classification analysis indicated that the ASCA was accurate on approximately 80% of the sample. The ASCA had an overall accuracy (hit) rate of 80.7% correctly identifying Emotionally Disturbed children, which was lower than found in the results of this present study.

Discriminant validity and distinct group differences were analyzed with the ASCA rating scale to determine its accuracy in differentiating ADHD from CD students. Based upon the ADHD and Conduct Disorder criteria set forth by the NIMH Diagnostic Interview Schedule for Children-Fourth Edition (DISC-IV), the ASCA was impressive in its ability to predict group membership for ADHD and CD students which further supports the diagnostic efficiency of this instrument.

Kessel & Zimmerman (1993) suggested that validity assessment procedures and accuracy rates should be expressed in terms of sensitivity and specificity. For the purpose of this study, sensitivity refered to the rating

scale's ability to correctly identify students with ADHD from CD. Whereas specificity refered to the ability of the rating scale to correctly identify students with CD from ADHD. As stated earlier, the overall correct classification (hit) rate for the ASCA in this current study is higher than those found in previous studies (McDermott et al. 1995). As presented in Figure 1, the ASCA achieved an overall correct classification (hit) rate of 92% when differentiating ADHD students from CD students with a kappa coefficient that indicated significant agreement beyond chance. Specifically, the ASCA was able to accurately identify the ADHD students in 96.5% of the cases and identified CD students correctly 75% of the time.

The ASCA rating scale also demonstrated significant capabilities to predict group membership for ADHD and CD students. The positive predictive power, or the proportion of children accurately identified as ADHD on the ASCA (.93), provided significant support for the diagnostic efficiency of the instrument. Similarly, the ability of the ASCA (.86) to accurately identify CD students was considered significant. Sensitivity and specificity estimates in the current study are also higher than those found by Doyle et al. (1997) in assessing the diagnostic efficiency of the Behavior Assessment Scale for Children-

Parent Rating Scale and the Child Behavior Checklist. Worth mentioning is that Doyle et al. (1997) compared those referred and diagnosed to those referred but not formally diagnosed, which could partially account for the lower sensitivity and specificity estimates.

As presented earlier, the ASCA has gained empirical evidence for score validity and reliability. These current results further support the strength and utility of this measure. Because of the superior standardization sample and the fact that the ASCA measures many different dimensions of psychopathology, clinicians are advised to select the ASCA when evaluating children and adolescents. The ASCA is based on teacher's observations and has demonstrated the ability to correctly identify group membership between children with ADHD and Conduct Disorder.

Limitations of the present study emerge from the participants included. Due to the large effect sizes obtained in the present study, the small sample size did not diminish the statistical power of the results. However, the participants were comprised from only a few different school districts within the Midwest geographic area. Additionally, the sample was not representative of the entire population for which the instrument may be used. Though there was adequate Caucasian representation, there

was poor representation of Hispanic, Native American, African American and Asian American students. Replication with a larger sample size and better representation of other racial/ethnic groups is recommended in order to provide better generalizability.

The present results illustrated strong evidence of distinct group differences and discriminant validity for the ASCA. The diagnostic utility of this instrument was demonstrated through correctly classifying students as ADHD or CD. Noteworthy is that although the students met the criteria used by this study for classifying students into particular groups, it should not be assumed that they would be formally diagnosed as either ADHD or CD. A more comprehensive evaluation would be necessary in order to make this formal diagnosis.

Further research should be committed to examining the adequacy of rating scales in psychological measurement. More costly and time consuming methods of assessment can be avoided with increased confidence in utilizing already available instruments. Specifically, a replication of this study should be conducted which includes the matching of students on variables such as age, gender and ethnicity. Students not being matched on such variables may be considered a weakness of the present study. It can be

argued that the differences observed between the two groups was in part a result of behaviors typically displayed for referred students in that particular age group. By matching students on such variables, we can be more confident that the differences found in the present study were not related to age disparity between groups. Overall, additional research is needed in order to establish more definitive conclusions about the symptomology and course of these externalizing behavior disorders.

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Table 1

Sample Demographic Characteristics.

	ADHD		CD	
	n	%	*n*	%
Gender				
Male	27	90.0	5	71.4
Female	3	10.0	2	28.6
Race/Ethnicity				
Caucasian	25	83.3	3	42.9
Biracial	1	3.3	-	
Hispanic/Latino	4	13.3	4	57.1
Grade				
K	1	3.3	-	-
1	3	10.0	-	-
2	3	10.0	-	-
3	4	13.3	-	-
4	2	6.7	-	-
6	1	3.3	2	28.6
7	1	3.3	-	-
9	4	13.3	1	14.3
10	7	23.4	2	28.6
11	4	13.3	1	14.3
12	-	-	1	14.3
Disability				
Not Disabled	19	63.3	4	57.1
Specific Learning Disability	8	26.7	2	28.6
Speech/Language Disability	3	10.0	1	14.3

Table 2

Univariate ANOVAs for Adjustment Scales for Children and Adolescents Syndromes.

Core Syndrome	*SS*	*df*	*MS*	*F*	*p*	η^2
ADH	11.12	1	11.12	.17	.68	.01
SAP	945.88	1	945.88	8.32	.01	.19
SAI	1077.15	1	1077.15	9.66	.00	.22
OPD	689.73	1	689.73	6.81	.01	.16
DIF	62.17	1	62.17	.52	.48	.02
AVO	101.71	1	101.71	.66	.42	.02
DEL	1535.41	1	1535.41	9.71	.00	.22

Note. MANOVA for Adjustment Scales for Children and Adolescents Core Syndromes: Wilks $\Lambda = .53$, $F(7, 36) = 3.72$, $p < .005$, Multivariate Effect Size = .47, Power = .94. Univariate ANOVA *F*-tests *df* (2, 29). On all significant effects students with CD obtained higher ASCA scores than students in the ADHD group. ADH = Attention-Deficit Hyperactive, SAP = Solitary Aggressive (Provocative), SAI = Solitary Aggressive (Impulsive), OPD = Oppositional Defiant, DIF = Diffident, AVO = Avoidant, DEL = Delinquent.

Table 3

Descriptive Statistics, F, and Effect Size Estimates for Differences Between the ADHD and CD Groups.

	ADHD		CD			
Core Syndrome	*M*	*SD*	*M*	*SD*	*F*	Δ
Attention Deficit-Hyperactive	60.40	9.54	59.00	5.39	.17	.14
Solitary Aggressive (Provocative)	57.23	11.85	70.14	2.27	8.32	1.29
Solitary Aggressive (Impulsive)	53.37	10.80	67.14	9.17	9.66	1.38
Oppositional Defiant	57.83	10.58	68.86	6.34	6.81	1.10
Diffident	51.17	12.30	47.86	10.14	.52	.33
Avoidant	55.77	13.94	60.00	9.02	.66	.42
Delinquent	57.27	13.00	73.71	6.05	9.71	1.64

Note. ADHD = Attention Deficit Hyperactivity Disorder; CD = Conduct Disorder, Δ = Glass' Delta (Glass & Hopkins, 1996).

Table 4

Fisher's Linear Discriminant Function Coefficients for the Adjustment Scales for Children and Adolescents.

ASCA Core Syndrome	ADHD	CD
Attention Deficit-Hyperactive	1.188	.990
Solitary Aggressive (Provocative)	-8.531	-8.839
Solitary Aggressive (Impulsive)	.135	.283
Oppositional Defiant	.467	.514
Diffident	.577	.497
Avoidant	.209	.238
Delinquent	.117	.198
Constant	-74.703	-84.073

Note. ADHD = Attention Deficit Hyperactivity Disorder; CD = Conduct Disorder.

Diagnostic Efficiency Table

		Diagnosis: ADHD	Diagnosis: CD	Total
Test	ADHD	28	2	30
	CD	1	6	7
	Total	29	8	37

Results

Sensitivity (True Positive Rate) = 0.9655
Specificity (True Negative Rate) = 0.75
Positive Predictive Power = 0.9333
Negative Predictive Power = 0.86
False Positive Rate = 0.25
False Negative Rate = 0.0345
Overall Correct Classification (Hit) Rate = 0.9189

Observed Agreement Po = 0.9189
Chance Agreement Pc = 0.6764

Kappa = 0.7494
Standard Error of Kappa = 0.163810095

Significance Test for Kappa Ho: k = 0 Z = 4.574809627
p < 0.00000477 two-tail test
p < 0.00000239 one-tail test